

## CLAIMS

### What Is Claimed Is:

1           1.       A variable reflectance vehicle mirror which can be controlled to adjust  
2 reflectivity, comprising:  
3               a super twisted nematic (STN) liquid crystal cell having a front side and a  
4 rear side;  
5               a first polarization filter positioned on the front side of said STN liquid  
6 crystal cell;  
7               a second polarization filter positioned on the rear side of said STN liquid  
8 crystal cell;  
9               a reflective layer positioned adjacent to said second polarization filter; and  
10              a control circuit connected to said STN liquid crystal cell for controlling  
11 the birefringence of the STN liquid crystal cell to adjust the degree of reflection of the  
12 mirror.

1           2.       The variable reflectance vehicle mirror of claim 1, wherein said STN  
2 liquid crystal cell includes a layer of super twisted nematic (STN) liquid crystal material  
3 positioned between a pair of transparent electrodes.

1           3.       The variable reflectance vehicle mirror of claim 2, wherein said STN  
2 liquid crystal material possesses a twist angle between approximately 180° and  
3 approximately 270° between the pair of electrodes.

1           4.       The variable reflectance vehicle mirror of claim 3, wherein said STN  
2 liquid crystal material possesses a twist angle of approximately 210°.

1           5.       The variable reflectance vehicle mirror of claim 2, wherein said STN  
2 liquid crystal material further includes a cholesteric material.

1           6.       The variable reflectance vehicle mirror of claim 3, wherein the surfaces of  
2 the pair of electrodes facing one another each include an alignment layer positioned  
3 thereon for orienting the STN liquid crystal material to its desired twist angle.

1           7.       The variable reflectance vehicle mirror of claim 6, wherein the alignment  
2 layers comprise a polymer material which is surface treated to provide the desired  
3 orientation of the STN liquid crystal material.

1           8.       The variable reflectance vehicle mirror of claim 1, wherein said STN  
2 liquid crystal cell further comprises front and rear transparent plates respectively  
3 positioned adjacent to outer surfaces of said electrodes.

1           9.       The variable reflectance vehicle mirror of claim 8, wherein said front and  
2 rear transparent plates are adhered together around their periphery to seal said STN liquid  
3 crystal cell together.

1           10.      The variable reflectance vehicle mirror of claim 9, further comprising  
2 spacers being positioned in said STN liquid crystal material between the front and rear  
3 transparent plates in order to provide a constant thickness of the space between the front  
4 and rear transparent plates.

1           11.      The variable reflectance vehicle mirror of claim 1, wherein the first and  
2 second polarization filters are crossed polarizers.

1           12.      The variable reflectance vehicle mirror of claim 3, wherein the said  
2 control circuit is connected to said pair of transparent electrodes to apply a bias voltage  
3 across said electrodes.

1           13.      The variable reflectance vehicle mirror of claim 12, wherein the bias  
2 voltage applied across said electrodes by said control circuit may be varied to vary the  
3 twist angle of the STN liquid crystal material between said electrodes in order to alter the  
4 reflectivity of the mirror to a desired level.

1           14.      The variable reflectance vehicle mirror of claim 13, wherein said mirror is  
2 controllable over a continuous range of reflectance by varying the bias voltage applied  
3 across said electrodes.

1           15.     The variable reflectance vehicle mirror of claim 1, wherein said control  
2 circuit includes a voltage regulator capable of receiving a source of power from a vehicle  
3 from between approximately 6 - 40 volts d.c. and generating a bias voltage to be applied  
4 to said STN liquid cell between approximately 2.7 to 5.5. volts d.c.

1           16.     The variable reflectance vehicle mirror of claim 15, wherein said voltage  
2 regulator enables the mirror to be retrofit into all existing vehicles by utilizes an existing  
3 power harness in the vehicle which provides approximately 6 - 40 volts d.c.

1           17.     The variable reflectance vehicle mirror of claim 1, wherein said control  
2 circuit is formed as a stacked IC.

1           18.     The variable reflectance vehicle mirror of claim 1, wherein said control  
2 circuit includes an oscillator formed within the stacked IC for variably adjusting a driving  
3 frequency applied to the STN liquid crystal cell.

1           19.     The variable reflectance vehicle mirror of claim 1, further comprising a  
2 first photo sensor for detecting an intensity of light impinging upon said first photo  
3 sensor, said control circuit being connected to said photo sensors for applying a bias  
4 voltage to said STN liquid crystal cell in accordance with the intensity of the light  
5 detected by said first photo sensor.

1           20.     The variable reflectance vehicle mirror of claim 19, wherein the bias  
2 voltage applied to said STN liquid crystal cell may be adjusted to provide a desired  
3 reflectivity of light by the mirror in accordance with the detected intensity of light.

1           21.     The variable reflectance vehicle mirror of claim 1, wherein said mirror is  
2 formed to include a rimless outer periphery.

1           22.     The variable reflectance vehicle mirror of claim 1, wherein rimless outer  
2 periphery of said mirror is accomplished by trimming the stacked configuration of the  
3 STN liquid crystal cell, first and second polarization filters, and reflective layer after the  
4 stacked configuration is formed.

1           23.     The variable reflectance vehicle mirror of claim 1, wherein the stacked  
2 configuration of the STN liquid crystal cell, first and second polarization filters, and  
3 reflective layer are trimmed using a water jet to fuse the edges of these layers in the  
4 stacked configuration together.

1           24.     The variable reflectance vehicle mirror of claim 1, wherein the mirror can  
2 be controlled to adjust the level of reflectivity to a value between approximately 28% and  
3 approximately 94%.

1           25.     The variable reflectance vehicle mirror of claim 1, further comprising a  
2 first photo sensor for detecting an intensity of a glare-causing light impinging upon said  
3 photo sensor and providing a signal indicative of the intensity of the light detected, said  
4 control circuit being connected to said first photo sensor for receiving the signal  
5 indicative of the intensity of the light detected and applying a bias voltage to said STN  
6 liquid crystal cell accordingly to control the degree of reflectivity of the mirror.

1           26.     The variable reflectance vehicle mirror of claim 25, further comprising a  
2 second photo sensor for detecting ambient light levels and providing a signal indicating  
3 when the intensity of the ambient light detected is greater than a threshold value, said  
4 control circuit being connected to said second photo sensor for receiving the signal  
5 indicative of the intensity of the ambient light detected being greater than the threshold  
6 value so that said control circuit disables the effect of the first photo sensor in controlling  
7 the degree of reflectivity of the mirror when the ambient light detected being greater than  
8 the threshold value.

1           27.     The variable reflectance vehicle mirror of claim 26, wherein said first and  
2 second photo sensors are directly attached to a housing for the mirror.

1           28.     The variable reflectance vehicle mirror of claim 1, wherein said mirror is  
2 an independently controlled interior rearview mirror for a vehicle.

1           29.     The variable reflectance vehicle mirror of claim 1, wherein said mirror is  
2 an independently controlled exterior mirror for a vehicle.

1           30.     The variable reflectance vehicle mirror of claim 1, further comprising:  
2 an anterior transparent panel adjacent to said first polarization filter; and

3 a posterior transparent panel adjacent to said reflective layer adjacent to  
4 said second polarization filter.

1 31. The variable reflectance vehicle mirror of claim 30, wherein said anterior  
2 transparent panel and said posterior transparent panel are comprised of glass.

1 32. The variable reflectance vehicle mirror of claim 30, wherein said anterior  
2 transparent panel and said posterior transparent panel are comprised of synthetic plastic.

1 33. The variable reflectance vehicle mirror of claim 30, wherein said anterior  
2 transparent panel includes at least one optically enhancing coating.

1 34. The variable reflectance vehicle mirror of claim 30, wherein said anterior  
2 transparent panel includes an abrasion resistant coating formed thereon.

1 35. The variable reflectance vehicle mirror of claim 34, wherein said abrasion  
2 resistant coating comprises an organo-silicone (methylpolysiloxane) polymer with a  
3 thickness of approximately 2 to 10 microns.

1 36. The variable reflectance vehicle mirror of claim 30, wherein said anterior  
2 transparent panel includes a hydrophilic coating formed thereon comprising zirconia and  
3 silicone dioxide.

1 37. The variable reflectance vehicle mirror of claim 30, wherein at least one of  
2 said anterior and posterior transparent panels includes a hydrophobic coating containing a  
3 concentration of oxides and a concentration of perfluoroalkylsilane.

1 38. A variable reflectance vehicle mirror which can be controlled to adjust  
2 reflectivity, wherein the variable reflectance is provided by a super twisted nematic  
3 (STN) liquid crystal cell having variably controllable transmittance.

1 39. The variable reflectance vehicle mirror of claim 38, wherein the  
2 birefringence of the STN liquid crystal cell is controlled to adjust the reflectivity of the  
3 mirror.

1           40.    The variable reflectance vehicle mirror of claim 38, wherein the  
2 reflectance is continuously variable.

1           41.    The variable reflectance vehicle mirror of claim 38, further comprising a  
2 control circuit connected to said STN liquid crystal cell for controlling the birefringence  
3 of the STN liquid crystal cell to adjust the reflectivity of the mirror.

1           42.    The variable reflectance vehicle mirror of claim 38, further comprising:  
2 a first polarization filter positioned on a front side of said STN liquid  
3 crystal cell;  
4 a second polarization filter positioned on a rear side of said STN liquid  
5 crystal cell; and  
6 a reflective layer positioned adjacent to said second polarization filter.

1           43.    The variable reflectance vehicle mirror of claim 42, wherein said  
2 reflective layer comprises an enhanced aluminum material.

1           44.    A variable reflectance vehicle mirror which can be controlled to adjust  
2 reflectivity, comprising:  
3 a super twisted nematic (STN) liquid crystal cell having a front side and a  
4 rear side;  
5 a first polarization filter positioned on the front side of said STN liquid  
6 crystal cell;  
7 a second polarization filter positioned on the rear side of said STN liquid  
8 crystal cell; and  
9 a reflective layer positioned adjacent to said second polarization filter;  
10 wherein the variable reflectance vehicle mirror is formed to have a rimless  
11 outer periphery.

1           45.    The variable reflectance vehicle mirror of claim 44, wherein the rimless  
2 outer periphery of said mirror is achieved by trimming the stacked configuration of the  
3 STN liquid crystal cell, first and second polarization filters, and reflective layer after the  
4 stacked configuration is formed.

1           46.     The variable reflectance vehicle mirror of claim 45, wherein the outer  
2 periphery of said mirror is trimmed by a water jet procedure which fuses an outer  
3 periphery of the various layers of said mirror together to provide a weather-resistant seal  
4 around the outer periphery of said mirror.

1           47.     A control device for controlling the reflectivity of a variable reflectance  
2 vehicle mirror which utilizes a super twisted nematic (STN) liquid crystal cell to control  
3 reflectivity, comprising:  
4                 a light detector for detecting an intensity of light impinging upon the  
5 variable reflectance mirror; and  
6                 a control circuit responsive to the detected light intensity which is  
7 connected to the STN liquid crystal cell for controlling the birefringence of the STN  
8 liquid crystal cell to adjust reflectivity of the mirror.

1           48.     The control device of claim 47, wherein said control circuit controls the  
2 birefringence of the STN liquid crystal cell by controlling a bias voltage applied across  
3 the STN liquid crystal cell.

1           49.     The control device of claim 48, wherein the bias voltage applied across the  
2 STN liquid crystal cell may be varied to vary a twist angle of molecules of a STN liquid  
3 crystal material contained within the STN liquid crystal cell to alter the reflectivity of the  
4 mirror to a desired level.

1           50.     The control device of claim 49, wherein said STN liquid crystal material  
2 possesses a twist angle between approximately 180° and approximately 270° in the STN  
3 liquid crystal cell.

1           51.     The control device of claim 50, wherein said STN liquid crystal material  
2 possesses a twist angle of approximately 210°.

1           52.     The control device of claim 47, wherein said control circuit may control  
2 the reflectance of the variable reflectance mirror over a continuous range by varying the  
3 bias voltage applied across the STN liquid crystal cell.

1           53.     The control device of claim 47, further comprising a voltage regulator  
2 capable of receiving a source of power from a vehicle from between approximately 6 - 40  
3 volts d.c. and generating a bias voltage to be applied to said STN liquid crystal cell  
4 between approximately 2.7 to 5.5. volts d.c.

57. The control device of claim 47, wherein the bias voltage applied to said STN liquid crystal cell may be adjusted to provide a desired reflectivity of light by the mirror in accordance with the detected intensity of light.